

EMS Focus

A Collaborative Federal Webinar Series

Staying Safe on the Road: How You Can Help Make Ambulances Safer and Prevent Crashes

WHEN AMBULANCES CRASH

EMS Provider & Patient Safety



DATA COLLECTED BETWEEN 1992-2011

4,500

vehicle traffic crashes involving an ambulance per year

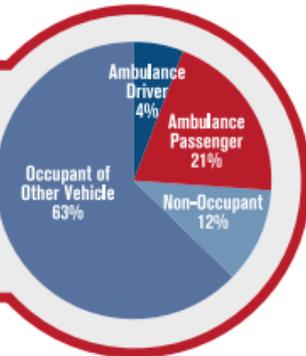
ESTIMATED ANNUAL AVERAGE

34%

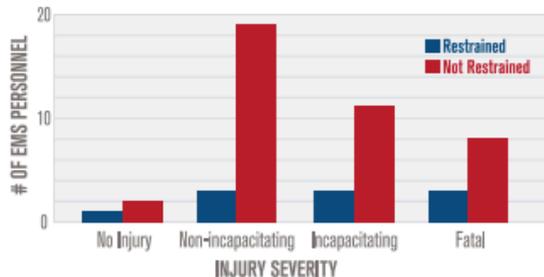
resulted in injuries

33

people killed per year



Injury Severity and Use of Safety Restraints in EMS Providers*



84%

OF EMS PROVIDERS
IN THE PATIENT COMPARTMENT



WERE NOT RESTRAINED*

ONLY 33%
OF PATIENTS

WERE SECURED*

WITH SHOULDER AND LAP RESTRAINTS

*IN SERIOUS CRASHES
INVESTIGATED BY
NHTSA

44% of patients were
ejected from the cot
in serious crashes*



61%
restrained
with lateral
belts only*

38%
shoulder
harnesses
were
available
but were
not used*

SIT DOWN & BUCKLE UP!
Secure Your Patients. They Rely on You!

This safety message brought to
you by NHTSA's Office of EMS.



ems.gov

Today

- ▶ Reporting vehicle and equipment defects
- ▶ Defect investigations and recalls
- ▶ Ambulance crash investigations
- ▶ Questions

Today's Speakers

- ▶ Peter Kivett

- ▶ Safety Defects Engineer, NHTSA Office of Defects Investigation

- ▶ Harold Herrera

- ▶ Crash Investigation Specialist, NHTSA Special Crash Investigation Program

- ▶ Max Sevareid, MPH

- ▶ EMS Specialist, NHTSA Office of EMS



Office of Defects Investigation Initiation

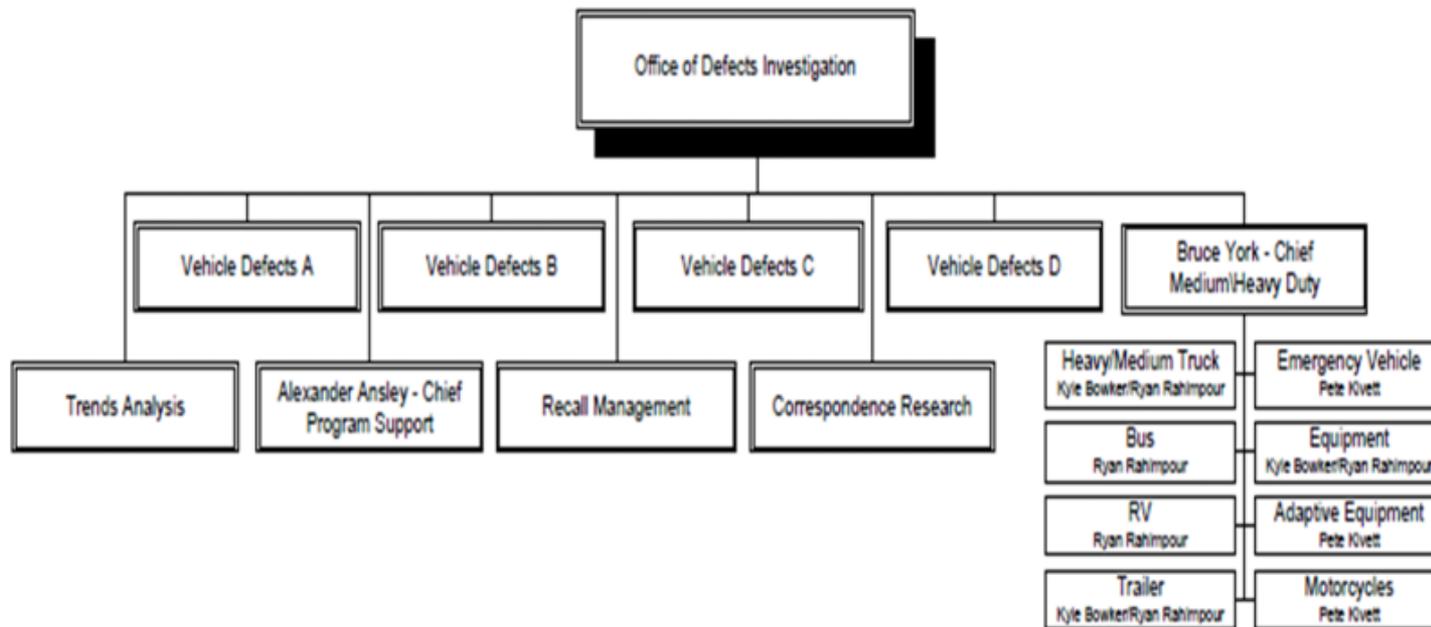
What Can ODI Do For You

Peter Kivett
Office of Defects Investigation

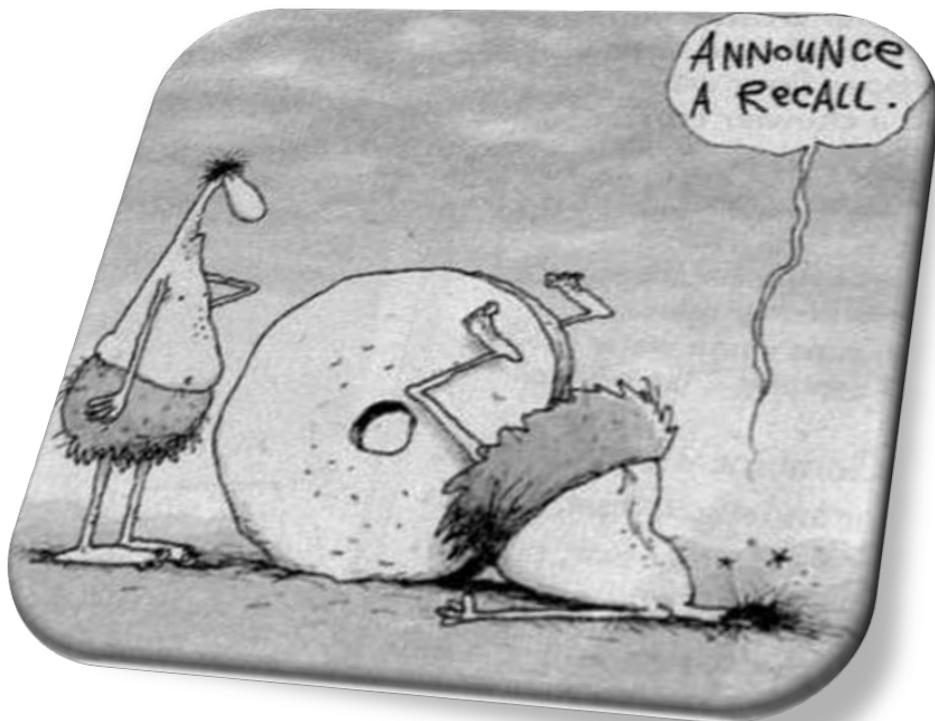
AGENDA

- Mission
- Safety Defect Definition and Review
- ODI Investigation Initiation Process

Office of Defects Investigation



Office of Defects Investigation Mission



Office of Defects Investigation Mission

- ▶ Identify design or manufacturer defects relating to motor vehicle safety
- ▶ Assure that defects are remedied effectively and promptly
- ▶ Assure that non-confidential information relating to investigations and recalls is made available to the public
- ▶ www.nhtsa.gov



ODI Jurisdiction

▶ Vehicles licensed for road use

- ▷ Cars, motorcycles
- ▷ RVs, HD trucks, buses

▶ Vehicle Equipment

- ▷ Tires
- ▷ Child Restraints
- ▷ Accessories



NHTSA Consumer Vehicle Complaint Process



Risk Matrix

Risk-Based Processes for Safety Defect Analysis and Management of Recalls

https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/14895_odi_defectsrecalls_pubdoc_110520-v6a-tag.pdf

Pre-investigative, Generic Risk Matrix used by ODI for Risk Ranking and Resource Prioritization Purposes

Severity Level	Severity Factors		Frequency Level				
	Detectability of Condition	Consequence of Failure	1	2	3	4	5
SL-5	None/poor detectability	Severe or fatal injury	Y	R	R	R	R
SL-4		Moderate injury	G	Y	R	R	R
SL-3	Good/reasonable detectability	Severe or fatal injury	G	G	Y	R	R
SL-2		Moderate injury	G	G	G	Y	R
SL-1	Not considered	Minor Injury	G	G	G	G	Y

Notes:

Detectability: Presence or lack of warning lights, messaging and notifications; audible warnings and abnormal noises; vehicle handling and/or performance anomalies, the presence of which would be reasonably expected to be noticeable by a typical driver or occupant.

Consequence: Severe injury means AIS 3 and above injuries, including death, that typically require significant medical treatment and/or hospitalization, moderate means AIS 2 type injuries, and minor means AIS 1 or any injury allegation such as minor cuts or soft tissue.

Incidents: Appear to involve a common fault condition and consequence.

Common Fault Condition: Same/similar part, failure mode, and conditions leading to failure.

Common Fault Consequence: Same/similar failure mode and effects caused by failure.

What is a Safety Defect

- ▶ Safety-Related Defect (Pursued by ODI): Any defect in performance, design, construction, component, or material that results in an unreasonable risk of crash or an unreasonable risk of death or injury in an accident.
 - ▷ A safety-related defect may exist on a vehicle even though it meets all FMVSS requirements.
 - ▷ A safety-related defect includes: *nonoperational and mission specific*



Investigation Process

▶ (PE) Preliminary Evaluation

- ▶ Confirm complaint(s)
- ▶ Gather parts
- ▶ Work w/ industry
- ▶ Contact peer municipalities
- ▶ Review current & past precedent activity
- ▶ Document and summarize information gathered
- ▶ Influence safety recall, close or upgrade
- ▶ 4 months

▶ (EA) Engineering Analysis

- ▶ Testing/Survey(s)
- ▶ 2nd mfr response analyzed
- ▶ Influence safety recall or close investigation
- ▶ 1 year

ODI RESUME			
 U.S. Department of Transportation National Highway Traffic Safety Administration	Investigation: PE 07-043	Date Closed: 12/17/2007	
	Date Opened: 08/14/2007		
	Investigator: Peter Kivett		
	Subject: 400 AMP PRIMARY FUSE CORROSION		
MANUFACTURER & PRODUCT INFORMATION			
Manufacturer:	REV Ambulance Group Orlando, INC.		
Products:	2004-07 WHEELED COACH AMBULANCES ON FORD CHASSIS		
Population:	1,008		
Problem Description:	CORROSION TO THE PRIMARY FUSE BLOCK CIRCUIT MAY RESULT IN A LOSS OF POWER TO THE INTERIOR/EXTERIOR LIGHTS AND EQUIPMENT IN THE PATIENT COMPARTMENT OF THE AMBULANCE.		
FAILURE REPORT SUMMARY			
	ODI	Manufacturer	Total
Complaints:	0	12	12
Crashes/Fires:	0	0	0
Injury Incidents:	0	0	0
Fatality Incidents:	0	0	0
Other*:	0	51	51
*Description of Other: WARRANTY REPORTS			
ACTION / SUMMARY INFORMATION			
Action:	THIS PRELIMINARY EVALUATION IS CLOSED. WHEELED COACH HAS SUBMITTED SAFETY RECALL 07V-509 TO ADDRESS THE PROBLEM.		
Summary:	<p>THE OFFICE OF DEFECTS INVESTIGATION (ODI) OPENED THIS PRELIMINARY EVALUATION ON WHEELED COACH OUT OF CONCERN ABOUT A LOSS OF POWER TO THE INTERIOR/EXTERIOR LIGHTS (INCLUDING WARNING LIGHTS) AND EQUIPMENT IN THE PATIENT AREA OF THE AMBULANCE.</p> <p>AN APRIL 20, 2007 A CORRECTIVE ACTION REQUEST WAS ISSUED BY WHEEL COACH CONCERNING CORROSION TO THE SUBJECT VEHICLES 400 AMP PRIMARY FUSE CIRCUIT. FAILURE OF THIS CIRCUIT RESULTS IN A LOSS OF POWER TO EMERGENCY EQUIPMENT INSIDE THE AMBULANCE BODY, AS WELL AS LOSS OF THE VEHICLE'S EMERGENCY LIGHTS. ODI WAS CONCERNED THAT THE APRIL 2007 CORRECTIVE ACTION REQUEST WAS INADEQUATE. ODI OPENED THIS INVESTIGATION AND DISCOVERED THAT ALL OF THE WARRANTY CLAIMS AND COMPLAINTS WERE LOCATED IN "SALT-BELT" STATES. THE CORROSION TO THE FUSE BLOCK IS ATTRIBUTED TO ROAD SALT CHEMICALS USED DURING INCLEMENT WEATHER.</p> <p>ODI BELIEVES VOLTAGE TO THE PATIENT TRANSPORT MODULAR IS INHERENTLY CRITICAL TO THE AMBULANCE'S MISSION. FURTHERMORE, ODI BELIEVES THIS LOSS OF POWER REPRESENTS AN UNREASONABLE RISK TO MOTOR VEHICLE SAFETY FOR THIS APPLICATION, AS THE MISSION OF THE VEHICLE (AMBULANCE) IS COMPROMISED AND, THEREFORE, A SAFETY RECALL REMEDY IS APPROPRIATE. WITH WHEELED COACH'S SUBMITTAL OF A "S73" LETTER, RECALLING ALL AMBULANCES IN 21 SALT BELT STATES (PLUS WASHINGTON DC), THIS INVESTIGATION IS CLOSED. ODI WILL CONTINUE TO MONITOR NON-SALT BELT STATES FOR ANY INDICATION THAT THE PROBLEM IS SPREADING TO THOSE REGIONS.</p>		

Investigation: PE 07-043

Close Resume Page 1 of 2

ODI Outreach

- ▶ Service managers
- ▶ Field Reps
- ▶ Government officials
- ▶ Fire Chiefs
- ▶ Police
- ▶ EMS



Your Complaint may be serviced/remedied by the manufacturer but your fellow colleague will not get the fix!

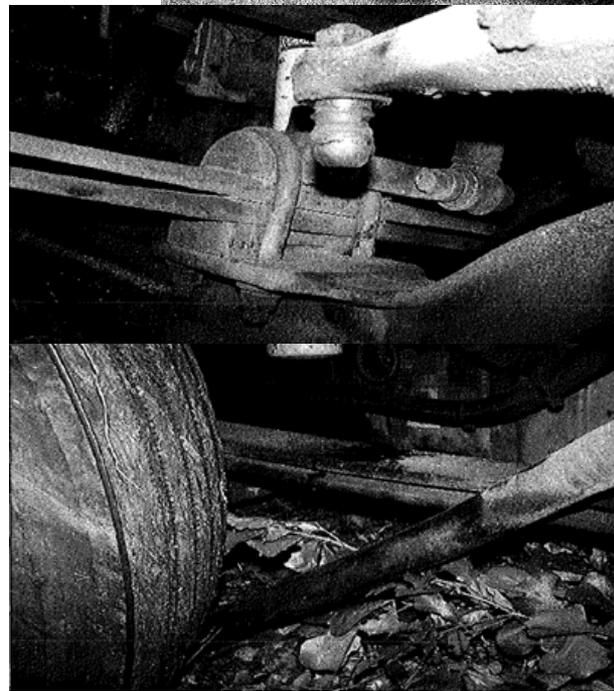
Example Investigations

- ▶ Issue: Wheel off event
- ▶ Alleged cause: Loose or cracked lug nut
- ▶ Result: Recall – 9,814 vehicles
- ▶ ODI prompt: 4 reports



Example Investigations

- ▶ Issue: Total loss of steering
- ▶ Cause: Drag link failure
- ▶ Result: Recall - 111,050 vehicles
- ▶ ODI prompt: 1 report





Special Crash Investigations Program



Harold Herrera
Crash Investigation Division
Team Lead
Special Crash Investigations Program

Special Crash Investigations Overview

- ▶ The SCI program investigates ~100 crashes and non-crashes annually that are of priority interest to the agency:
 - ▷ Office of Defects Investigation (ODI)
 - ▷ Research
 - ▷ Rulemaking
 - ▷ Office of Emergency Medical Services (OEMS)
 - ▷ Any other offices
 - ▷ Other Agencies

- ▶ Cases are initiated solely on Agency needs

- ▶ Cases are published and made available to the public online

SCI Published Cases

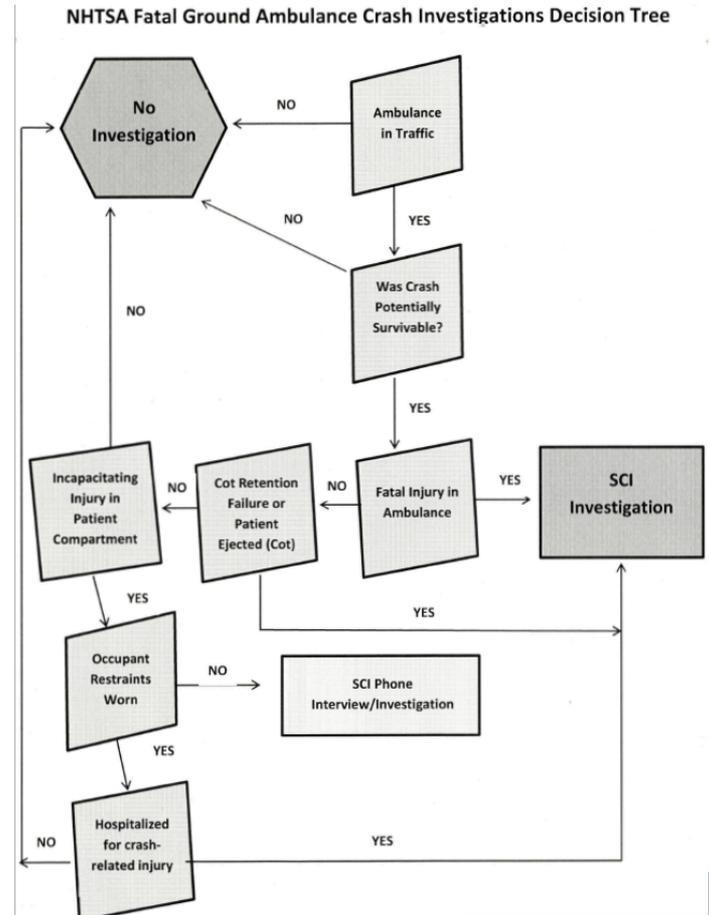
- ▶ SCI has published over 2,000 cases to the NHTSA website for public access since 1997
 - ▷ Many more in paper format prior to 1997
- ▶ Over 100 cases per year are published to NHTSA website
- ▶ All personally identifiable information is redacted from all published cases!!!

SCI Ambulance Crash Investigations

- ▶ 64 total ambulance crashes investigated
 - ▷ 2001 – 2004 contracted to conduct 6 investigations for the National Institute for Occupational Safety and Health (NIOSH)
 - ▷ 2007 – current
 - Conducted 58 investigations for NHTSA's OEMS
 - 4 closed
 - ~4 investigations annually

Selection/Inclusion Criteria

- ▶ Ambulance in traffic
- ▶ Was crash potentially survivable?
- ▶ Fatal injury in the ambulance?
- ▶ Cot retention failure
- ▶ Patient ejected?
- ▶ Incapacitating injury in patient compartment
 - ▷ Hospitalized for crash related injury
- ▶ Rollover
- ▶ Fatigue
- ▶ Others
- ▶ Ultimately, OEMS makes the call to investigate



Notification of Crashes

▶ Notifications come from numerous sources:

- ▷ NHTSA Office of EMS
- ▷ EMS Community
- ▷ Law Enforcement
- ▷ NHTSA Regional Offices
- ▷ CISS Field Offices
- ▷ Google Alerts
- ▷ First Responder links
- ▷ Etc.

Example SCI Investigation

2009 Ford E-350 Type II Ambulance

New Mexico

July 2016



Case Overview



▶ 2 vehicles involved

- ▶ 2009 Ford E-350 Type II Ambulance
 - 2nd manufacturing – equipped with Endeavor model in October 2009, by Medtec Ambulance
- ▶ 2009 Dodge Ram

Case Overview

▶ Total of 7 occupants in ambulance

- ▷ Driver and front row occupant (EMS student listed in EMS report as third-party ride-along) **both wearing seat belts**

- ▷ 5 other occupants in patient compartment area:
 - Patient's mother
 - Patient premature, unrestrained 6-week-old in a incubator that was anchored to a sled that was mounted to the cot
 - Being transported from one hospital to another for emergency surgery
 - EMT – primary patient caregiver
 - 2 nurses from hospital

None of the occupants in the patient compartment were belted

Patient Compartment



Case Overview

Scene

- ▶ 4-leg intersection
- ▶ Line of site:
 - ▷ Westbound traffic obstructed for ambulance
 - ▷ RAM was in freeway underpass



Case Overview

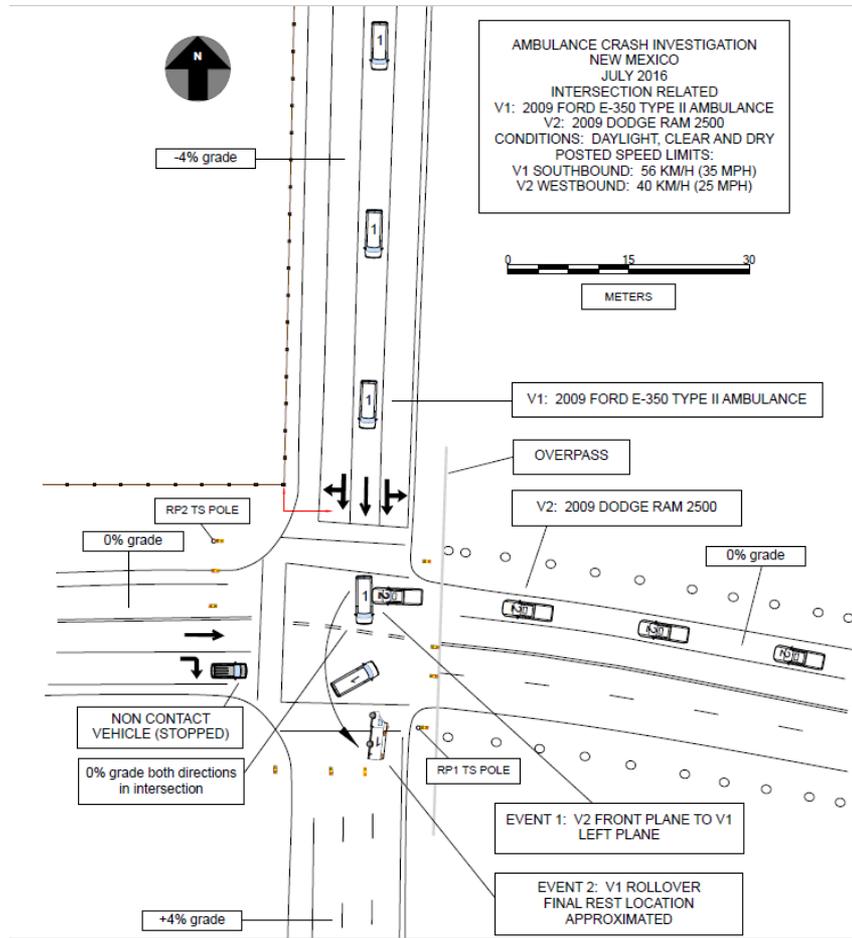
- ▶ Ambulance driver stated to police:
 - ▷ Emergency light and siren activated
 - ▷ Braked, looked left and right, sounded air horn
 - ▷ Saw traffic had stopped, observed RAM slowing, proceeded into intersection with yellow traffic light

- ▶ RAM driver stated to police:
 - ▷ Heard ambulance siren prior to seeing it, braked but no time to stop

- ▶ Front of RAM struck right rear of ambulance

- ▶ Impact caused ambulance to rotate CCW, rollover ¼ turn and came to rest on right side

Overview of Crash Scene

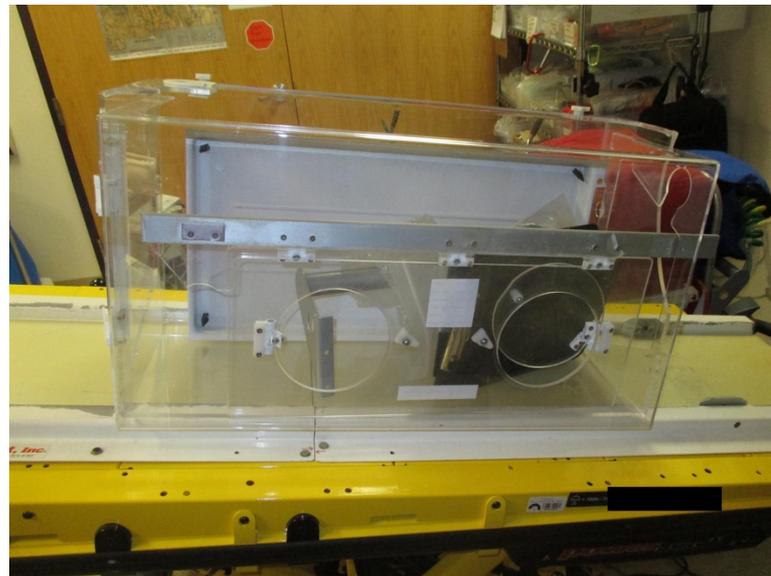


Police On-scene Images



Case Overview – Post-Crash

- ▶ During the crash-rollover, the top mounted access door of the incubator came open and the 6-week-old was ejected from the incubator
 - ▷ One of the nurses located the 6-week-old and began emergency breathing procedures until first responders arrived on scene
 - ▷ Transferred by air to hospital in another state and admitted for emergency surgery. She expired 28 days post crash cause of death is unknown

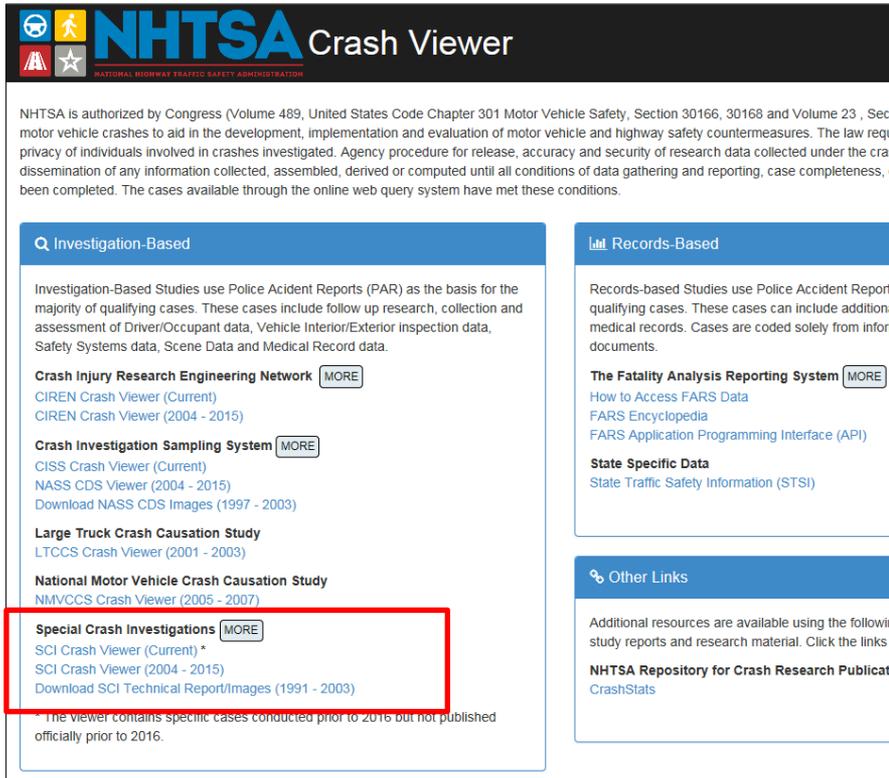


Conclusions

- ▶ Both front occupants were wearing their seat belts – GOOD OUTCOME in a rollover crash!!!
- ▶ Although none of the rear occupants were wearing seat belts they fortunately only sustained minor/moderate injuries

Wearing seat belts has good outcome in crashes

Data and Technical Reports



The screenshot shows the NHTSA Crash Viewer website. At the top left is the NHTSA logo with the text 'NHTSA Crash Viewer' and 'NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION'. Below the logo is a paragraph of text explaining NHTSA's authorization by Congress. The main content area is divided into two columns. The left column is titled 'Investigation-Based' and lists several studies: 'Crash Injury Research Engineering Network', 'Crash Investigation Sampling System', 'Large Truck Crash Causation Study', 'National Motor Vehicle Crash Causation Study', and 'Special Crash Investigations'. The 'Special Crash Investigations' entry is highlighted with a red box. The right column is titled 'Records-Based' and lists 'The Fatality Analysis Reporting System' and 'State Specific Data'. Below these columns is an 'Other Links' section with additional resources.

Investigation-Based

Investigation-Based Studies use Police Accident Reports (PAR) as the basis for the majority of qualifying cases. These cases include follow up research, collection and assessment of Driver/Occupant data, Vehicle Interior/Exterior inspection data, Safety Systems data, Scene Data and Medical Record data.

Crash Injury Research Engineering Network [MORE](#)
CIREN Crash Viewer (Current)
CIREN Crash Viewer (2004 - 2015)

Crash Investigation Sampling System [MORE](#)
CISS Crash Viewer (Current)
NASS CDS Viewer (2004 - 2015)
[Download NASS CDS Images \(1997 - 2003\)](#)

Large Truck Crash Causation Study
LTCCS Crash Viewer (2001 - 2003)

National Motor Vehicle Crash Causation Study
NIMVCCS Crash Viewer (2005 - 2007)

Special Crash Investigations [MORE](#)
SCI Crash Viewer (Current) *
SCI Crash Viewer (2004 - 2015)
[Download SCI Technical Report/Images \(1991 - 2003\)](#)

* The viewer contains specific cases conducted prior to 2016 but not published officially prior to 2016.

Records-Based

Records-based Studies use Police Accident Reports as the basis for the majority of qualifying cases. These cases can include additional information from medical records. Cases are coded solely from information in the police accident reports.

The Fatality Analysis Reporting System [MORE](#)
[How to Access FARS Data](#)
[FARS Encyclopedia](#)
[FARS Application Programming Interface \(API\)](#)

State Specific Data
[State Traffic Safety Information \(STSI\)](#)

Other Links

Additional resources are available using the following links. These links lead to study reports and research material. Click the links for more information.

NHTSA Repository for Crash Research Publications
[CrashStats](#)

[Crashviewer.nhtsa.dot.gov](https://crashviewer.nhtsa.dot.gov)

Data and Technical Reports

NHTSA Crash Viewer
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Special Crash Investigations (Current)

Search by Case Number or ID or DOT HS Number

Use this option if you already know Case ID or Case Number (sometimes also called Case String) or DOT HS Number.
Case Number consists of two letters and 5 numbers, like AB12345.
Case Id is a number with 4 to 8 digits, like 1234 or 12345678.
DOT HS Number is a number with 6 digits, like 123456.

Number or ID or DOT HS Number:

Search By SCI Case Type and Case Year

Use this option to search by SCI Case Type and/or Case Year. You can specify more than one value in SCI Case Type and more than one value for Case Year.

Type: Year:

- Adaptive Vehicle
- Advanced Air Bag - NHTSA
- Advanced Driver Assistance System
- Advanced Occupant Protection System - AOPS
- Air Bag Related Adult Driver
- Air Bag Related Adult Passenger
- Air Bag Related Children in RFCSS
- Air Bag Related Children NOT in RFCSS
- Alternative Fuel
- Ambulance
- Automated Driving System
- Child Safety Seat
- Crash Avoidance Technology
- Electric Vehicle
- Front Center Air Bag
- Guardrail End Treatment
- Inflatable Seat Belt
- Limousine Crash
- Motorcoach Fire

Search By Filters

Please select this option to query on basic variables that belongs to Crash, Person and/or Vehicle. Basic set of 30-40 variables is available and case will have to satisfy ALL the criterias to be included in

[Crashviewer.nhtsa.dot.gov](https://crashviewer.nhtsa.dot.gov)

Data and Technical Reports

NHTSA Crash Viewer SCI Case Number: DS16014
National Highway Traffic Safety Administration

Case Overview

- Measurements
 - Delta V
 - Exterior Vehicle
 - Tires
 - Crash Avoidance
 - Fuel
 - Fire
 - CDC
 - 10LZEW02
 - 00RDAO02
 - Crash Profile
 - EDR
 - Sketches
- Interior Vehicle
- Safety Systems
- Occupants (7)
- Vehicle 2
 - General Vehicle
 - Exterior Vehicle
- Images (110)
 - On Scene (4)
 - Crash Scene (17)
 - Vehicle 1 (8)
 - Vehicle 2 (8)
 - Vehicle Images (89)
 - Vehicle 1 (73)
 - Child Restraint (3)
 - Miscellaneous (5)
 - Fuel System (3)
 - Front Plane (1)
 - Front Left Oblique (1)
 - Left Plane (6)
 - Back Left Oblique (1)
 - Back Plane (3)**
 - Back Right Oblique (1)
 - Right Plane (12)
 - Front Right Oblique (1)
 - Top (10)

Vehicle 1 - Back Plane

Back Rollover measurements Rollover measurements



Questions?

Please submit questions through the webinar platform

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Visit





Visit



for more info on
ambulance safety
and other national
initiatives

Thank You